(12) UK Patent Application (19) GB (11) 2 254 193 (13) A

(43) Date of A publication 30.09.1992

(21) Application No 9103487.3

(22) Date of filing 27.03.1991

(51) INT CL[5]
H05K 9/00

(52) UK CL (Edition K)
H1R RBH

(56) Documents cited
GB 2027278 A

(58) Field of search
UK CL (Edition K) H1K KGC, H1R RBH
INT CL[5] H05K 9/00
Online databases : WPI

(71) Applicant
Telemecanique

(Incorporated in France)

43-45, Boulevard Franklin Roosevelt, 92500 Rueil Malmaison, France

(72) Inventors
Claude Briane
Rodolphe Picheronu

(74) Agent and/or Address for Service
Brian R Lucas
c/o Lucas George & Co, 135 Westhall Road, Warlingham, Surrey, CR3 9HJ, United Kingdom

(54) Device for the screening and insulation of an electronic circuit board

(57) In one embodiment the board (10) is attached to a frame (20) comprising a metal plate (22) extending along the board (10) on the welds side. It comprises a continuous sheet (30) so folded as to envelope the board, the sheet comprising an insulating base (32a, 34a, 36a) supporting a conductive screening layer (34b) solely or substantially solely on the side of the components and remote therefrom.

In a second embodiment, the board is attached to a frame of insulating material. The sheet comprises a base formed by an electrically conductive screening layer on an insulating layer. A second layer of insulation is provided over the screening layer solely or substantially solely on the side of the components.

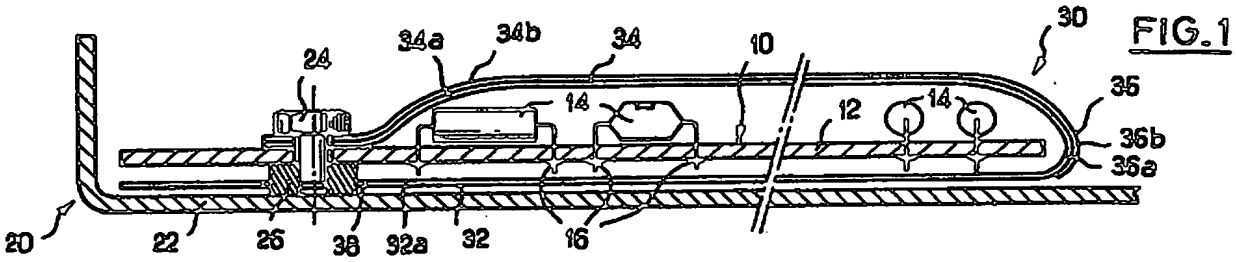


FIG.1

GB 2 254 193 A

FIG.1

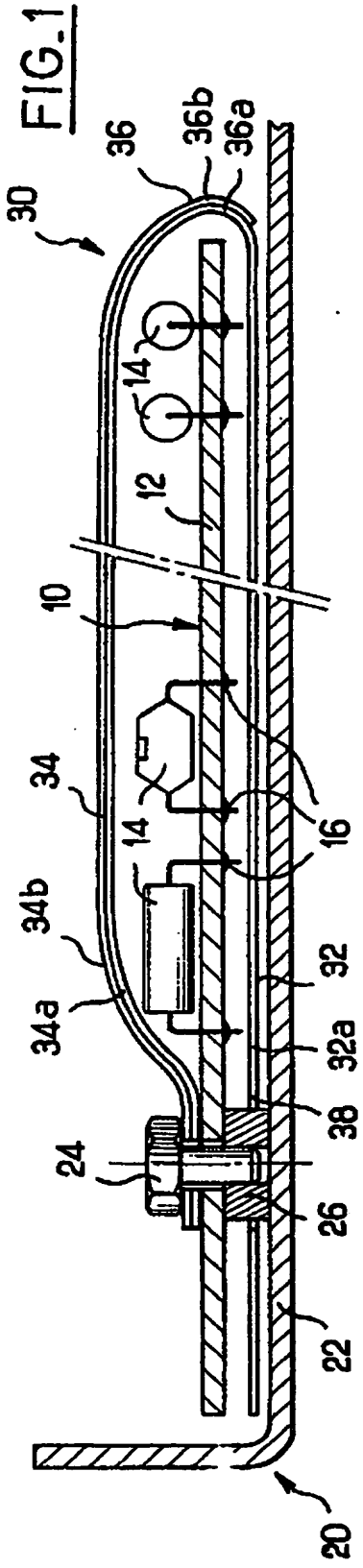


FIG.2

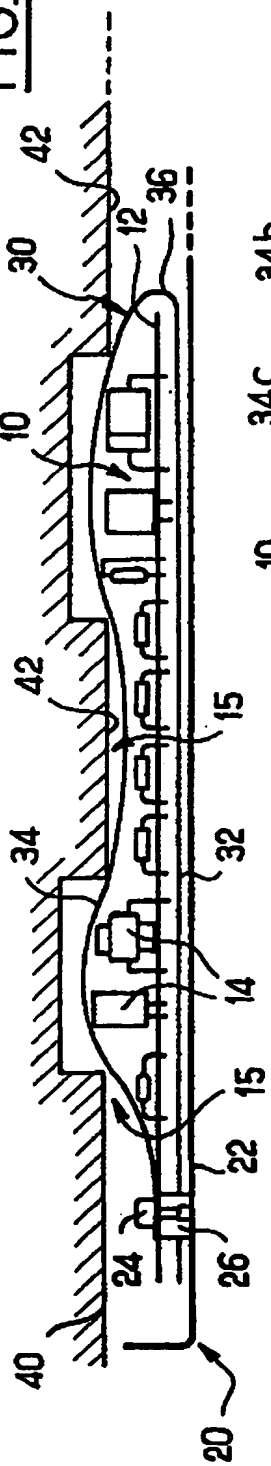


FIG.3

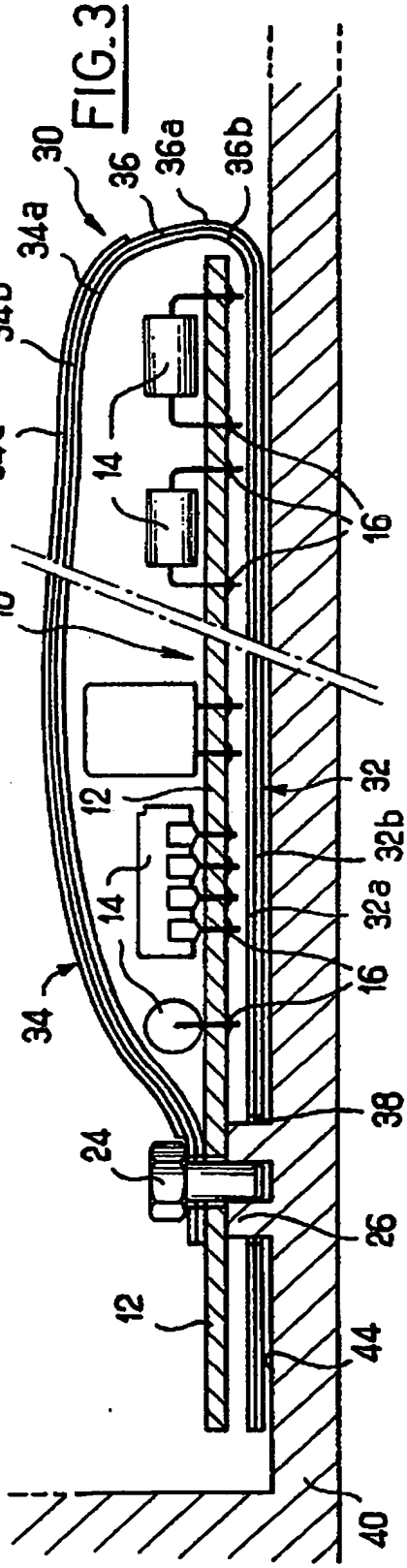


FIG.4

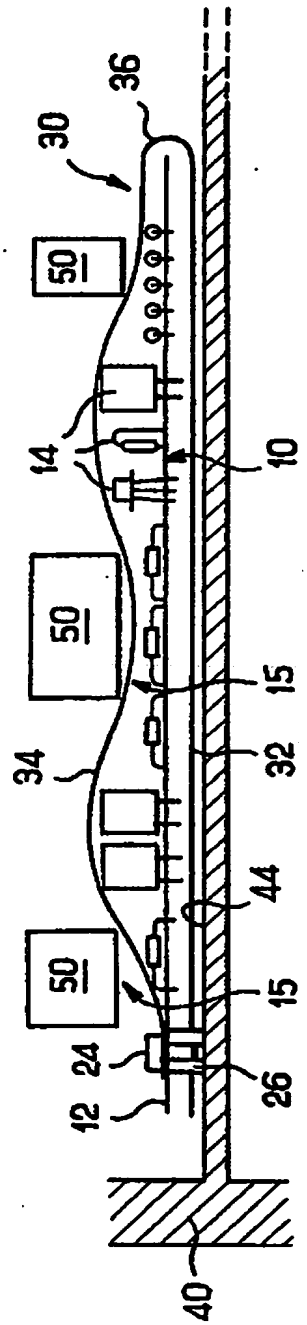


FIG.5

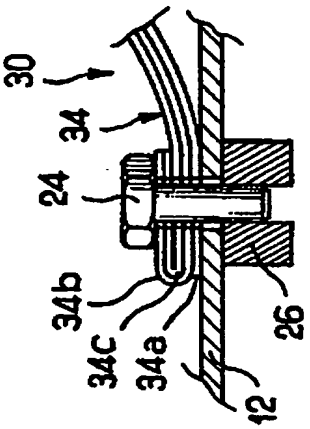
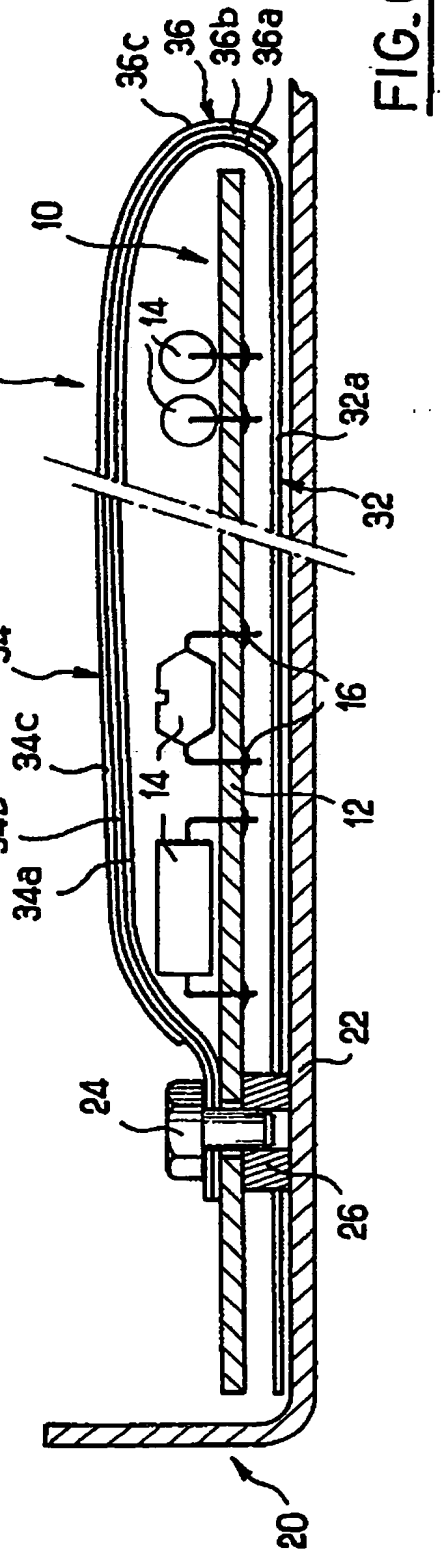


FIG.6



2254193

This invention relates to the insulation and screening of printed circuit boards.

In the prior art an electronic circuit board is conventionally mounted a small distance from a metal plate disposed on the side of the welds of the circuit and forming part of a frame. The metal plate ensures the screening of the circuit on the face in question, and a thin film of insulating material is provided between the board and the metal plate, to obviate any risk of earthing the projecting conductors of the various components. Moreover, a second metal screening plate is also provided on the side of the components which is lined with an insulating material to prevent any contact between the components and said second plate. The mounting of the assembly requires a large number of screws, nuts, small columns and/or spacers for the mounting of the board on the frame and for the mounting of the second screening plate and its insulating material above the board, on the components side.

Such a method is disadvantageous, since the presence of said mechanical mounting means and the various conductive and insulating plates substantially increases the cost of the apparatus and requires excessively long assembly times. The weight of apparatuses is also increased to an appreciable extent.

It is an object of at least preferred embodiments of the invention to obviate these disadvantages of the prior art and to provide screening and insulating means for an electronic circuit board which are light in weight, economical and very simple to use.

Another object of at least preferred embodiments of the invention is to enable an electronic circuit board to be brought close to other adjacent structures or members without the screening and insulating means forming a significant obstacle to such an approach.

To this end, a first aspect the invention relates to a device for screening and insulating an electronic circuit board, comprising components on one face and welds for said components on the other face, the board being attached to a frame comprising a metal plate extending along the board on the side of its welds, characterized in that it comprises a continuous sheet so folded as to enclose the board, the sheet comprising a base of insulating material which supports a layer of electrically conductive screening material solely or substantially solely on the side of the components and on its face remote therefrom.

Optionally, the sheet also comprises a second insulating layer disposed above the screening layer.

In another aspect, the invention relates to a device for screening and insulating an electronic circuit board, comprising components on one face and welds for said components on the other face, the board being attached to a frame comprising a surface of insulating material extending along the board on the side of its welds, characterized in that it comprises a continuous sheet so folded as to enclose the board, the sheet comprising a base formed by the super-position of an inner layer of insulating material and an outer screening layer of an electrically conductive material, said base supporting a second layer of insulating material solely or substantially solely on the side of the components and on its face remote therefrom.

Advantageously the screening layer is earthed via at least one screw for attaching the board to a support: contact with the or each screw being ensured either by designing the second insulating layer to locally disengage the screening layer circumjacent the screws, or else by folding the screening layer and the second insulating layer on themselves locally.

According to a particularly practical feature of the invention, the portion of the sheet extending between the board and the metal plate is located by means of spacers which support the board and which extend through holes with which said portion of the sheet is formed.

Preferably the or each insulating layer comprises polyester, while the screening layer comprises aluminium.

For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a schematic cross-section of an electronic circuit board having screening and insulating means according to a first embodiment of the invention;

Figure 2 is an overall view of Figure 1 in a particular environment;

Figure 3 is a schematic cross-section of an electronic circuit board having screening and insulating means according to a second embodiment of the invention;

Figure 4 is an overall view of Figure 3 in a particular environment;

Figure 5 is a view of a detail of a variant embodiment of the screening and insulating means shown in Figure 3; and

Figure 6 is a schematic cross-section of an electronic circuit board having screening and insulating means according to a third embodiment of the invention.

Referring first to Figure 1, there is shown an electronic printed circuit board, which is generally identified by reference numeral 10. Components 14 are mounted on one face (in this case the upper face) of the board 10 and welds 16 for said components are provided on the other face of the board 10.

In this embodiment the board 10 is attached to a metal frame 20 comprising a flat plate 22. The board 10 is attached to the plate 22 via screws 24 and spacers 26 (only one screw and one spacer are shown).

According to a first aspect of the invention, to produce the screening and electrical insulation of the board 10 use is made of a continuous sheet 30 comprising a first portion 32 extending between the board 10 and the frame plate 22 and a second portion 34 extending above the board on the components side. A U-shaped fold

36 of the sheet along one edge (in this case the straight edge) of the board unites the two portions 32, 34 of the unitary sheet.

The lower portion 32 of the sheet is formed by a single layer 32a of an insulating material such as polyester. On the other hand, the U-shaped portion and the upper portion 34 respectively comprise, apart from the insulating layer 36a, 34a, corresponding to the prolongation of the layer 32a, a layer 36b, 34b of a conductive material which is applied to the outside of the polyester layer and attached thereto, locally or over its whole surface, by any suitable means, more particularly gluing or the use of a double faced intermediate adhesive film. The conductive material preferably used is aluminium.

It should be noted that to make the drawings clearer, the thicknesses of the different layers of the sheet are shown exaggerated in Figure 1 and the other drawings.

Thus, on the welds side, the insulation between the welds 16 and the metal plate 22 is ensured by a single layer 32a of polyester, while the plate 22 itself provides screening. On the components side insulation is provided by the layer 34a of polyester, while the layer 34b of aluminium borne thereby provides screening.

The sheet 30 is attached around the board 10 by any means. In this particular instance the lower portion 32 floats between the board 10 and the flat plate 22 and is retained in place via suitable holes 38 formed in the sheet and through which the spacers 26 extend. The portion 34 of the sheet is simply placed above the board and retained on one side (on the right) by the transition fold 36 with the portion 32, and on the other side (the left) by holes with which said portion is formed and through which the screws 24 extend. It should

be noted that this attachment, via which the screw heads contact the aluminium layer 34b, also earths said screening layer 34b.

Moreover, by this method the screws 24 locally ensure the attachment together of the layers 34a and 34b of the portion 34 of the sheet, and there is no need to use specific attaching means in this zone. In a simplified embodiment, apart from the attachment via the screws 24, the layers 34a and 34b are held together by an adhesive.

Figure 2 shows a case in which the board 10, the frame 20 and the screening and insulating sheet 30 (Figure 1) are incorporated in a casing or partition or the like 40 made of an insulating material.

As can be seen from Figure 2, for reasons of space, portions 42 of the casing 40 which project in the direction of the board 10 are to a certain extent fitted into gaps 15 between the components 14. In this way the distance between the board 10 and the casing 40 can be reduced to make the assembly more compact.

For this application it is important to use a sufficiently flexible sheet. A satisfactory flexibility can be obtained by using a polyester layer having a thickness of the order of 50 to 250 microns, and an aluminium layer having a thickness of the same order of magnitude.

Figures 3 and 4 show a second embodiment of the invention.

In Figures 3 and 4 and the other drawings like or similar elements to those in the preceding drawings have like references.

In this embodiment the board 10 is no longer attached to a metal frame, but directly to a flat surface 44 of a casing 40 made of insulating material. In this case the screening of the board 10 on the welds

side is no longer ensured by the casing 40. Moreover, the board 10 is disposed adjacent members, indicated diagrammatically at 50 (cf. Figure 4) which must be prevented at all costs from contacting earth, in this particular instance the conductive layer 34b of the upper portion 34 of the sheet 30 which is independently earthed.

To ensure screening of the board 10 on the welds side, the sheet 30 comprises a first portion 32, between the board 10 and the portion 44 of the casing, which is formed by the super- position of an insulating layer 32a on the welds side and a conductive layer 32b on the casing side.

The two layers 32a and 32b are continued at 36a, 34a and 36b, 34b respectively to define on the other side of the board 10 an insulating layer in relation to the components 14 of the board 10 and a layer for screening the board respectively. In this case also, therefore, the sheet 30 is continuous.

To prevent the members 50 being earthed, the portion 34 of the sheet also comprises, outside the conductive layer 34b, a second insulating layer 34c which prevents the member 50 from contacting the earth formed by the layer 34b.

In this embodiment also the insulating layers are preferably of polyester and the conductive layer is preferably of aluminium.

The lower portion 32 of the sheet therefore ensures the screening of the board and the insulation of the welds 16 in relation to the layer 32b forming the screening, while the upper portion 34 ensures screening and insulation in relation to the components 14 and insulation in relation to the members 50.

In dependence on the arrangement of the adjacent members 50, the second insulating layer 34c and the

conductive layer 34b can be continued or not at the 180° fold of the sheet; in this embodiment the layers 34b and 34c stop at the transition between the portions 34 and 36 of the sheet.

The sheet 30 in this embodiment can be retained in place, for example, like the sheet 30 in Figures 1 and 2.

In this embodiment the additional layer provided outside the portion 34 of the sheet can be attached by any suitable means, using the screws 24 or not, to the polyester/aluminium composite unitary with the portion 32.

In the embodiment illustrated in Figure 3 the layer 34b is earthed by stopping the outer layer 34c at a predetermined distance from the free edge, remote from the fold 36, of the subjacent layers 34a, 34b, so as to disengage the aluminium layer 34b over a marginal zone; electric contact between the screw heads 24 and the layer 34b is thus made possible. In this case the layer 34c is attached to the layer 34b.

Figure 5 shows a variant embodiment in which the screws 24 are able simultaneously to earth the conductive layer 34b and locally attach the layer 34c to the layers 34a and 34b. In this variant, in the zone of the edge remote from the fold 36 the layers 34b and 34c are folded on themselves over a short distance at the level of the location of the screws. In this way the conductive layer 34b is disengaged. Holes are provided for the passage of the screws 24, and when the screws are tightened, the screening layer 34b is earthed and the layers locally assembled at one and the same time. In this arrangement the layers do not have to be secured to one another.

Figure 4 shows the situation in which, in order to reduce space, the projecting members 50 have been fitted

into free spaces left between the components 14 of the board 10.

In this case also the portion 34 of the sheet is flexible enough to adapt itself to the relatively undulating gap which exists between the board 10 and the members 50, while efficiently ensuring the screening of the board 10 (and/or of the members 50) and the insulation of the components 14 and the members 50 in relation to the screening.

A much more compact electronic device can be obtained in this way.

Of course, the embodiments shown in Figures 1 and 3 can be combined. Thus, Figure 6 shows a variant in which the lower portion 32 of the sheet 30 comprises a single layer 32a of insulating material, while the upper portion comprises three layers - i.e., a conductive layer 34b sandwiched between two insulating layers 34a and 34c. The insulating layer 34a is continuous with the layer 32a, and the upper portion 34 can be made by applying to the layer 34a prolonging the layer 32a an insulating/conductive composite, by gluing or one of the other means disclosed hereinbefore.

This variant is more particularly suitable for cases in which the frame supporting the board 10 is of metal and itself provides the screening on the welds side, while members or elements 50 which must imperatively be insulated from the earth are capable of contacting the upper portion 34 of the sheet.

The invention is particularly well suited to cases in which the board 10 is a numerical circuit board, while the members 50 are components (transformer, capacitors, rectifiers, etc. ...) of a supply circuit of the board 10. Of course, however, this application is not limitative.

It will be noted that terms such as "upper",

"lower", etc. ... used throughout the description must be understood in a relative sense, since the board 10 and its surroundings can in practice have any desired orientation, for example a vertical one.

CLAIMS

1. A device for screening and insulating an electronic circuit board, comprising components on one face and welds for said components on the other face, the board being attached to a frame comprising a metal plate extending along the board on the side of its welds, characterized in that it comprises a continuous sheet so folded as to enclose the board, the sheet comprising a base of insulating material which supports a layer of electrically conductive screening material solely or substantially solely on the side of the components and on its face remote therefrom.

2. A device according to Claim 1, characterized in that the screening layer is earthed via at least one screw for attaching the board to a support.

3. A device according to one of Claims 1 and 2, characterized in that the sheet also comprises a second insulating layer disposed above the screening layer.

4. A device according to Claim 3, when appended to Claim 2, characterized in that the second insulating layer is so devised that the screening layer is locally disengaged with a view to contact with a screw head.

5. A device according to Claim 3, when appended to Claim 2, characterized in that in a region remote from the fold of the sheet, the screening layer and the second insulating layer are locally folded on themselves with a view to contact with a screw head.

6. A device according to any one of Claims 1 to 5, characterized in that the portion of the sheet extending between the board and the metal plate is fixed in position by means of spacers supporting the board which extend through holes with which said portion of the sheet is formed.

7. A device according to any one of Claims 1 to 6, characterized in that the or each insulating layer

comprises a polyester.

8. A device according to one of Claims 1 to 7, characterized in that the screening layer comprises aluminium.

9. A device for screening and insulating an electronic circuit board, comprising components on one face and welds for said components on the other face, the board being attached to a frame comprising a surface of insulating material extending along the board on the side of its welds, characterized in that it comprises a continuous sheet so folded as to enclose the board, the sheet comprising a base formed by the super-position of an inner layer of insulating material and an outer screening layer of an electrically conductive material, said base supporting a second layer of insulating material solely or substantially solely on the side of the components and on its face remote therefrom.

10. A device according to Claim 9, characterized in that the screening layer is earthed via at least one screw for attaching the board to a support.

11. A device according to Claim 10, characterized in that the second insulating layer is so devised that the screening layer is locally disengaged with a view to contact with a screw head.

12. A device according to Claim 10, characterized in that in a region remote from the fold of the sheet, the screening layer and the second insulating layer are locally folded on themselves with a view to contact with a screw head.

13. A device according to any one of Claims 9 to 12, characterized in that the portion of the sheet extending between the board and the insulating surface is fixed in position by means of spacers which support the board and extend through holes with which said portion of the sheet is formed.

14. A device according to any one of Claims 9 to 13, characterized in that the or each insulating layer comprises a polyester.

15. A device according to any one of Claims 9 to 14, characterized in that the screening layer comprises aluminium.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number 9106487.3

Relevant Technical fields

(i) UK Cl (Edition K) HIK (KQC) HIR (RBH)

(ii) Int Cl (Edition 5) H05K 9/00

Databases (see over)

(i) UK Patent Office

(ii) WPI ON-LINE

Search Examiner: N W Hall

Date of Search: 10 June 1991

Documents considered relevant following a search in respect of claims 1-15

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2027278 A (BURR-BROWN)	1,9

SF2(p)

TPPAAY

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

Published 1992 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.